

Claims:

1. A method, comprising:
propagating one or more pulses through a test device and an
interferometer;
5 measuring the temporal and spectral intensities of one or more pulses
propagated through the test device and the interferometer; and
determining the group delay of the test device using the temporal and
spectral intensity measurements.
- 10 2. The method of claim 1, wherein determining the group delay of the device
under test comprises:
determining the interferometric components of the temporal and spectral
measurements;
calculating the instantaneous frequency of the test device; and
15 calculating the group delay of the test device from the instantaneous
frequency of the test device.
3. The method of claim 2, wherein the interferometric components are
determined using Fourier transforms of the temporal and spectral
20 measurements.
4. The method of claim 1, wherein the group delay of a plurality of modes of
the test device are obtained from the measured temporal and spectral
intensities.
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5. The method of claim 1, further comprising generating the one or more
pulses wherein the one or more pulses are generated by a laser.
6. The method of claim 1, further comprising generating the one or more pulses

wherein the one or more pulses are generated by a monochromatic laser and a temporal modulator.

5 7. The method of claim 1, further comprising generating the one or more pulses wherein the one or more pulses are generated by a broadband source and a temporal modulator.

10 8. The method of claim 1, further comprising generating the one or more pulses wherein the one or more pulses are generated by a frequency-swept tunable laser.

15 9. The method of claim 1, wherein the one or more pulses are generated by a chirped pulse source to produce one or more chirped pulses having a known group delay, and wherein the group delay of the test device is determined using the spectral and temporal intensities and the group delay of the one or more chirped pulses.

20 10. An apparatus comprising
a means of measuring the temporal and spectral intensities of one or more pulses propagated through an interferometer and a test device; and
a means for determining the group delay of the test device using the measured spectral and temporal intensities.

25 11. The apparatus of claim 10, wherein the means for measuring the temporal intensity comprises a sampling oscilloscope.

12. The apparatus of claim 10, wherein the temporal intensity is measured based on nonlinear interaction of the one or more pulses with a short optical pulse.

13. The apparatus of claim 10, wherein the mean for measuring the spectral intensity comprises an optical spectrum analyzer.
- 5 14. The apparatus of claim 10, wherein the mean for measuring the spectral intensity comprises a Fabry-Perot etalon and a photodiode.
15. The apparatus of claim 10, further comprising an optical source for generating the one or more pulses.
- 10 16. The apparatus of claim 15, wherein the optical source comprises a laser.
17. The apparatus of claim 15, wherein the optical source comprises a monochromatic laser and a temporal modulator.
- 15 18. The apparatus of claim 15, wherein the optical source comprises a frequency-swept tunable laser.
19. The apparatus of claim 15, wherein the optical source comprises a
- 20 20. The apparatus of claim 10, wherein the means for determining the group delay of the test device uses the spectral intensity, the temporal intensity and a group delay of the one or more pulses to determine the group delay of the test device.
- 25 21. An apparatus comprising:
an interferometer;
a temporal intensity analyzer for measuring the temporal intensity of one or

- more pulses propagated through a test device and the interferometer;
a spectral intensity analyzer for measuring the spectral intensity of the one
or more pulses propagated through the test device and the interferometer;
and
- 5 a processor for determining the group delay of the test device using the
temporal and spectral intensities of the one or more pulses measured by the
temporal and spectral analyzers.
22. An apparatus comprising:
- 10 a means for determining the group delay of a test device from the spectral
and temporal intensities of one or more pulses propagated through the test
device and interferometer.